concrete construction

NOVEMBER 1958 VOL. 3, NO. 11

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FEATURES

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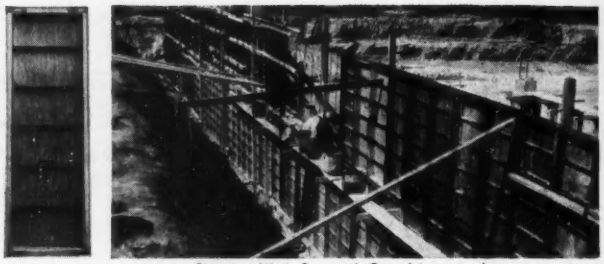

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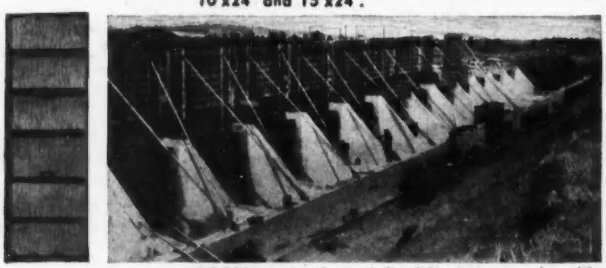

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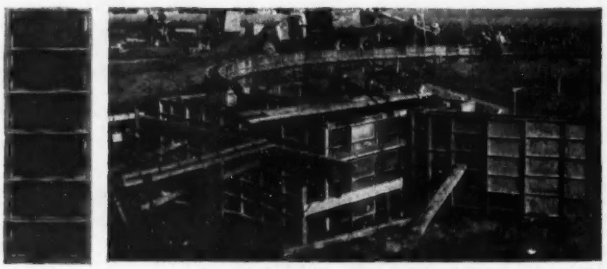

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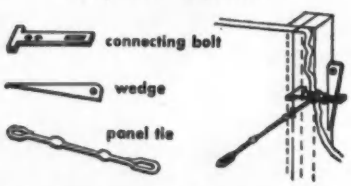

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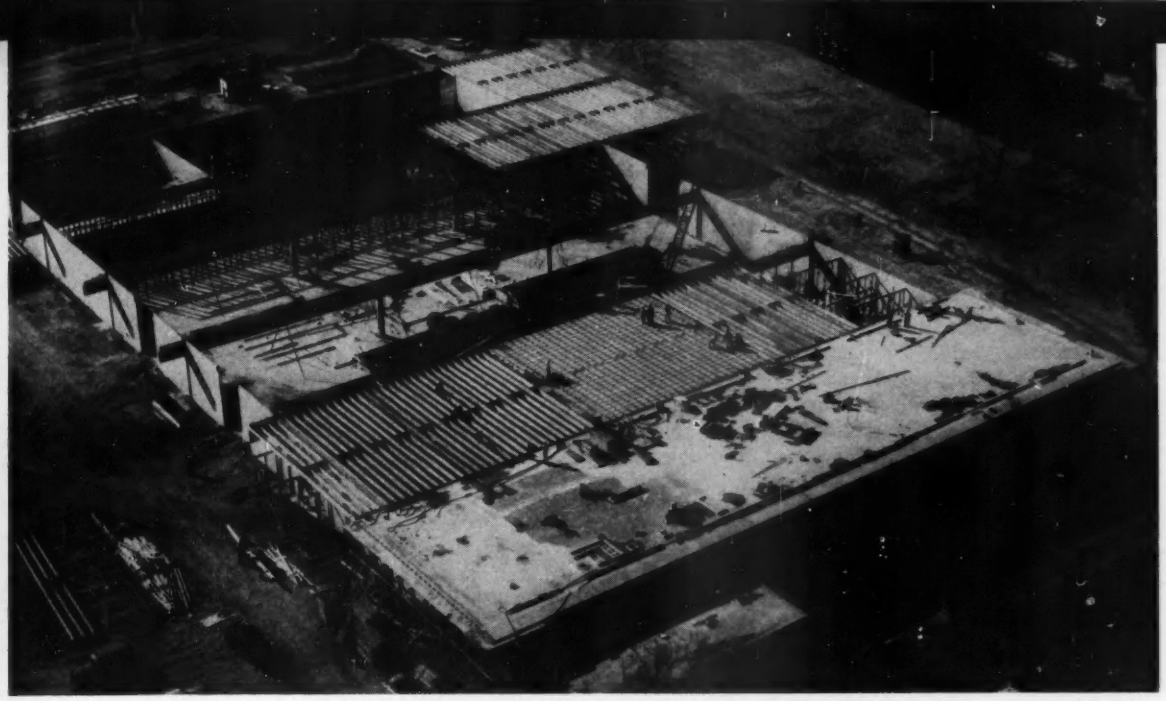


The design of this Los Angeles factory called for a permanent two-inch deep layer of water over the entire roof to facilitate air conditioning. The 3-inch thick expanded shale lightweight concrete deck was prestressed in two directions to make it watertight. No roofing or membrane was used. The deck was cast in 60- by 66-foot 6-inch squares (one bay) so as to minimize the effect of shrinkage and elastic shortening, and the squares were prestressed together to make water tight joints. The concrete had a unit weight of 108 pounds per cubic foot and a strength of 4,500 psi.

Water-Tight Concrete Roofs Without Roofing or Membrane

BY EDWARD K. RICE
T. Y. Lin and Associates
Los Angeles, California

PERMANENT FIREPROOF CONCRETE roofs which are water-tight without conventional roofing or membrane are now practical and economical in prestressed concrete.

To date, six major structures involving over 150,000 square feet of roof area have been constructed with water-tight prestressed concrete roofs. Five of these structures have roof parking and the sixth structure, due to an unusual air-conditioning system, has a 2 inch deep layer of water on the roof at all times. Three of these roofs have been in service for over two years and except for minor leaks at joints immediately after construction, they have proved to be water-tight.

All of the structures constructed to date are in a mild climate. However, since the prestressing makes the slabs crack-free and the concrete used is very carefully placed and finished to produce a dense wearing surface, it is expected that rreezing weather will not damage the prestressed concrete roof decks.

The basic theory used in designing a prestressed concrete deck for water-tightness is similar to that used for many years to make prestressed concrete tanks water-tight. By compressing each element of a concrete roof slab in both directions to a net compression of about 500 psi, the concrete is made crack-free and impervious to water. It has been interesting to note that the undersides of the roof slabs have shown no evidence of water seepage through the prestressed concrete slabs, even with as much as a 6 inch head of water on the top surface of a 3 inch slab.

The construction procedures used in making water-tight prestressed slabs are straight forward and no special equipment is required. To obtain maximum speed and economy, prestressed concrete lift-slab construction was used for all of the parking deck structures. The control and supervision of both steel and concrete placement was much easier at ground level—also, most of the shrinkage and elastic shortening of the slabs took place before the final connections were made to the columns and walls. Ready mixed concrete was

used on all of the jobs. Special care was taken in designing the concrete mix so as to hold the shrinkage to the minimum. This was accomplished by using a large quantity of maximum size aggregate (1½ inch) and holding the cement factor to the minimum (usually 6 sacks/yard). The concrete was placed with between 3 and 4 inches slump and the specified 28-day strength was 4000 psi. The specifications allowed the stressing of the post-tensioned tendons at a concrete strength of 3500 psi—this strength was in almost all cases achieved in seven to ten days.

It was necessary to carefully vibrate all of the concrete, particularly behind the prestressing tendon bearing plates around the steel lifting collars to prevent rock pockets. The finishing operation was done almost entirely with power trowels as it was found to be impossible to exert enough pressure to properly do the job by hand troweling. The slabs were power-troweled until all visible shrinkage cracks were closed.

A retarding admixture was found to greatly aid the finishing operation. The additional cost of troweling on a water-tight job over a conventionally troweled slab amounted to about $.01 to $.02 per square foot.

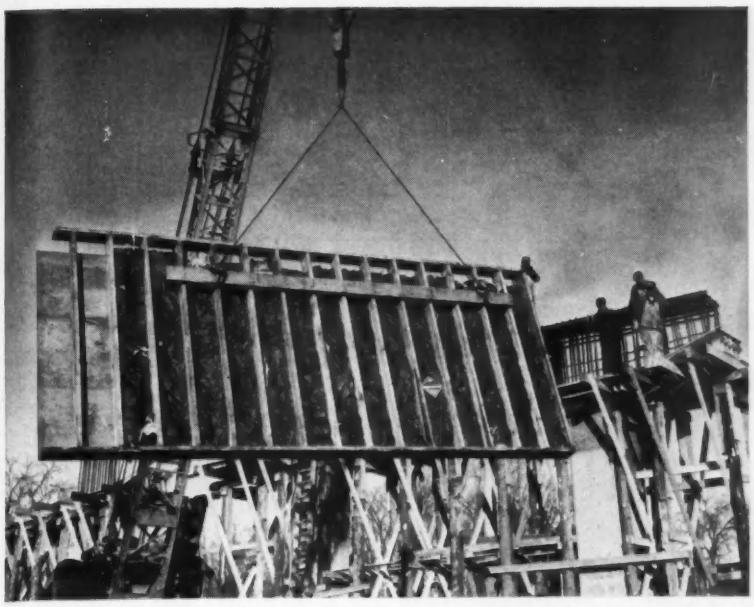
Curing of the slabs was accomplished by either water spray or membrane cure. Both methods worked well. Before prestressing, visible shrinkage cracks were observed on some of the slabs; however, the prestressing of the concrete completely closed the cracks and had the cracks not been marked before the stressing operation, it would have been virtually impossible to find them.

Lightweight concrete is placed efficiently at ground level from ready mix trucks. Note that the post-tensioned prestressing tendons are continuous and are draped the proper amount to give a level roof deck after the slab is lifted. Post-tensioned tendons (button head type) are spaced 30 inches o.c. and each tendon has from six to ten ¼-inch high-tensile steel wires.

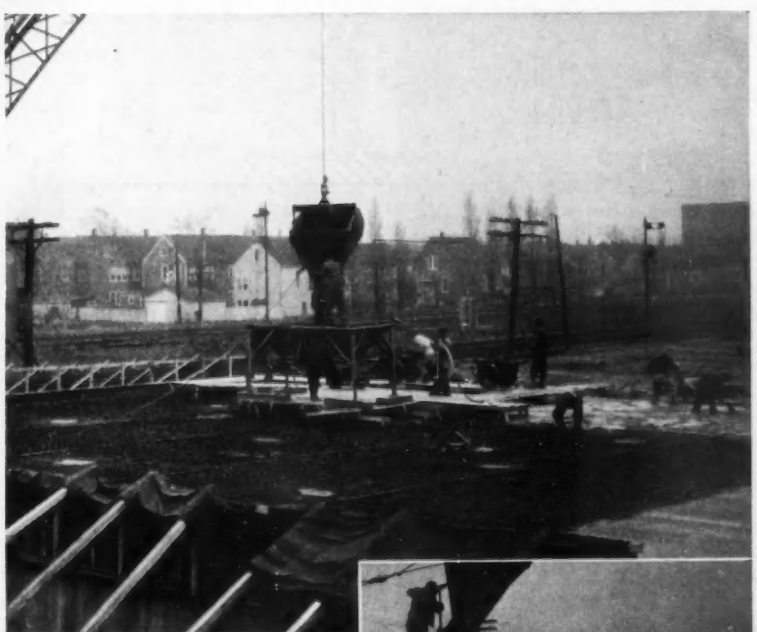
In water-tight slab structures all joints between slab sections and between the slabs and walls must be carefully designed and constructed. To date none of the slabs themselves has shown any leaks—the only leaks have been at the joints. All of the leaks to date are explainable and through better detailing could have been prevented entirely, as has been the experience on later jobs. On large roof areas it is necessary to force the expansion and contraction of the roof to take place in prepared joints which are made water-tight with a non-hardening plastic sealing compound.

From the standpoint of economy, the prestressing of roof structures to make them water-tight is sound on a first cost basis. The factory roof structure pictured here (page 5) was originally to have been constructed of prestressed concrete girders and joists with a conventionally reinforced concrete deck slab which was to be roofed in the usual manner. After construction had started, cost studies were made and an experimental section of prestressed concrete water-tight roof was constructed. By changing to a prestressed concrete roof deck, a first cost savings of $.21 per square foot was realized by prestressing the deck slab and eliminating the conventional roofing.

On parking decks, the prestressed concrete deck yields a net first cost savings of some $.30 to $.50 per square foot by eliminating the conventional membrane roofing and wearing surface. Both the first cost and long term advantage of this unconventional type of roof are large enough to suggest that a considerable number will be constructed in the future. END



CRANE swings insulated form section in place on Lee Interchange Bridge, part of the Massachusetts Turnpike. Forms were used 3 to 5 times. B. Perini & Sons, Inc., Framingham, Mass., was the contractor.



BIG REACH: Crane swings heated concrete to hopper for buggy delivery to remote sections of Western Avenue Reservoir roof. Remainder of pour, direct from bucket, went quickly. Reservoir was designed under supervision of George S. Salter, chief filtration engineer, City of Chicago. Contractor, M. J. Boyle & Co., Chicago.

HEATED TO 75°, concrete steams during hand pour of Chicago reservoir roof. At times, surface temperature of concrete dropped to low 40's, but climbed again when tarpaulins were replaced.

Two ways to put the heat on winter work

There's interesting contrast in the methods used to keep concrete warm on these two winter jobs. One contractor used a heated enclosure, the other insulated his forms. Both kept the concreting on schedule in sub-freezing weather.

On the Lee Interchange Bridge, the forms were insulated with wood fiber cellulose blankets. Thus insulated, the heat from 170° mix water and 60° aggregates, plus the heat of hydration in the setting concrete, kept internal temperatures sufficiently high for the entire curing time.

Roof pours for the Chicago reservoir were made with mix heated to 75°F. Forms were covered by 55,000 sq. ft. of canvas and heated with 8,000,000 BTU per hour from 44 heaters. This maintained the high curing temperatures needed. Tarps were removed only in the roof section being poured (4 one-day pours handled the job), then replaced.

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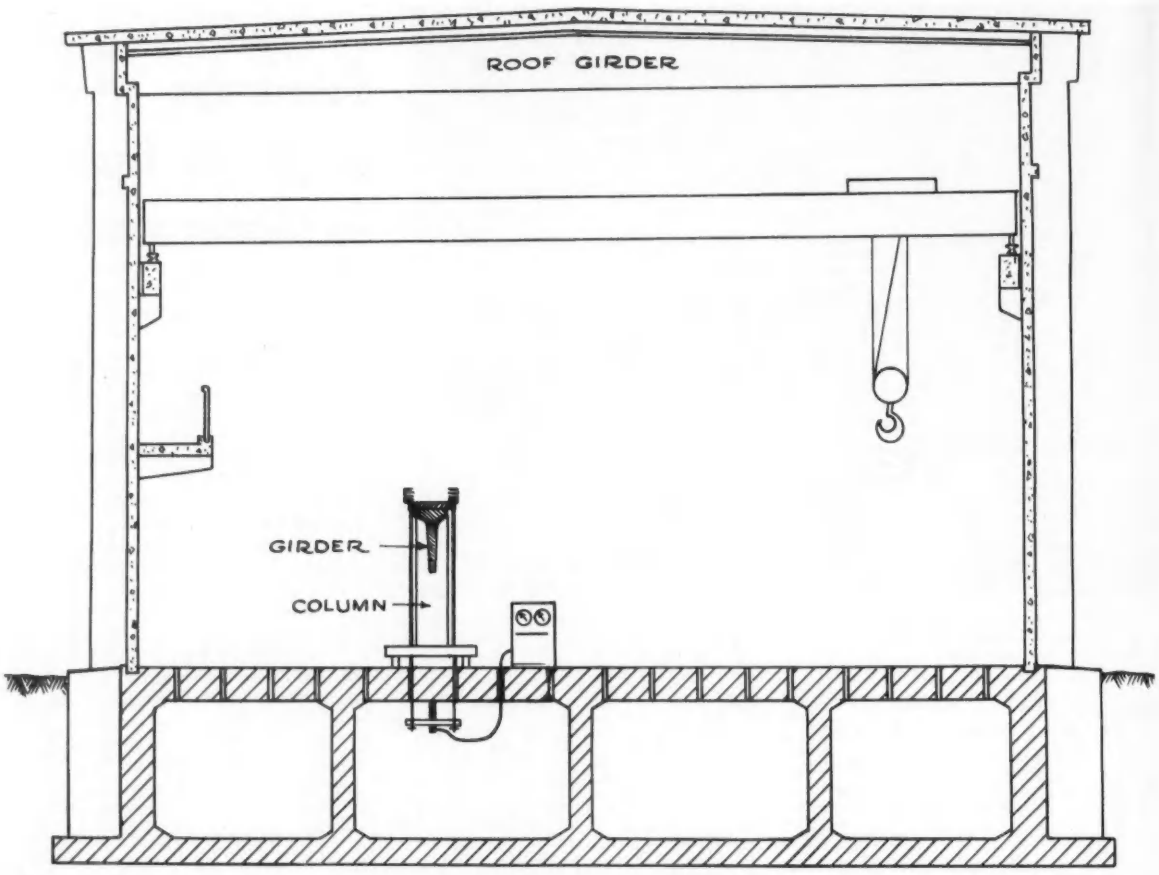


This cross-sectional view shows how one type of testing is carried out in the Portland Cement Association's new Structural Laboratory. The test floor is actually a heavily designed girder. Loads are applied by hydraulic jacks under the floor acting on steel rods that extend through holes to specimens above the floor. In this manner a 2 million-pound load can be applied to a 50-foot long girder.

PCA's structural laboratory explored future of concrete construction techniques before the ground was broken

NEW LAB'S CONSTRUCTION PREVIEWS FUTURE WORK

CONSTRUCTION OF THE Portland Cement Association's new Structural Laboratory gives a glimpse of some probable future practices in concrete construction. As would be expected, the Association made use of the most advanced current practice in concrete design, plus a few especially noteworthy innovations.

As a laboratory, the structure is unique and may well have a revolutionary effect on future structural testing laboratories. From an engineering standpoint, the most interesting portion of the building is the testing floor which is a large hollow box girder 12 feet deep, 56 feet wide and 120 feet long. Designed by bridge design methods, the floor is capable of withstanding test forces greater than 10 million pounds. The top surface of the floor is pierced by 690 holes on 3-foot centers. Most test forces are applied by hydraulic jacks on the underside of the top floor surface. These jacks pull on steel rods which extend through the holes in the floor and are attached to test specimens above.

This design makes the building an extremely flexible testing machine. An indication of its capabilities can be gained from the following figures: a floor or roof slab can be subjected to

This striking spiral concrete stairway, probably the first ever built, extends from the basement of the new building to the observation balcony. A reinforcing cage was threaded through holes in the precast tread units, which were then properly staggered and grouted.

local stresses of 30,000 pounds per square foot; a slab the size of the entire test floor could be subjected to a load of many thousands of pounds per square foot; and a 50-foot beam can be subjected to a load of 2 million pounds.

Because this laboratory has capabilities unmatched by any other facility in the world, it is expected to produce data having important effects on design of all types of concrete structures. Initial testing is aimed at improving connections between precast concrete elements, developing methods of achieving continuity between prestressed concrete units, and improving design of various types of concrete floor systems. A program has also been undertaken to develop needed engineering information on concrete shell roofs.

CONSTRUCTION

The entire building above the testing floor was assembled from site-precast concrete units. The building is 56 by 176 feet in plan. A 22-foot long bay at one end contains three stories of offices and shops. The rest of the building is one large room, 40 feet high, with an observation balcony for visitors. A 20-ton crane services the entire area of the large room.

Because most of the building consists essentially of a large crane bay, it was ideally suited to precast construction in which identical units can be repeated. Consequently, it is composed of eight 22-foot identical bents.

Each bent was assembled from two columns, a roof girder, two spandrel beams, two crane girders, two large wall panels, several smaller wall panels, and precast roof slabs. All structural elements were designed by the ultimate strength method, and most of them use special high-strength alloy steel bars for main reinforcing.

In producing these site-precast units, the contractor experienced no special problems. The main requirement was accurate formwork, since close tolerances were necessary to produce a proper fit in connecting the units. Excellent carpentry by the contractor's

forces kept rejects to a very low minimum.

CONCRETE

The concrete was divided into four classes for (1) foundations and other cast-in-place work; (2) lightweight wall panels; (3) precast roof girders; (4) other precast units. Concrete floor toppings were considered special.

Limestone coarse aggregate and natural sand fine aggregate were used in all concrete except for the wall panels which were made with expanded shale aggregate. All of the stone aggregate concrete was obtained from a ready mixed concrete plant.

For cast-in-place concrete, it was specified that the maximum size of aggregate should be 2 inches for floors and walls more than 12 inches thick, and 1½ inches for other construction.

The specification called for all concrete to have a strength of 5,000 psi at 28 days; maximum water content of 6½ gallons per sack; 4 to 7 percent air content; curing at minimum 50 degrees F. for 5 days with Type I cement, followed in the winter by controlled lowering of the temperature; maximum slump of 5 inches; and, for contract purposes, a cement factor of 7 sacks per cubic yard subject to adjustment with appropriate cost credit or debit.

The original plans called for part of the floor to be one-course and part two-course. The contractor obtained permission to use a two-course floor where desired. The difficulties of obtaining the desired finish with the one course floor under the specific conditions, and of protecting it during the remainder of the construction period, led to the use of a two-course floor in nearly all areas.

FLOORS

With the two-course floor, the structural slab was screeded to 1 inch below the finished elevation. This surface was subject to the dirt and wear of construction until the building was nearly complete. It was then thoroughly cleaned and roughened where necessary for good mechanical bond. The surface was wetted and a neat cement grout was broomed into it. The topping was placed before the grout had set, screeded and then compacted with a power float and trowel.

The topping consisted of a nominal mixture of one part cement, one part fine sand and two parts coarse aggregate by volume. The sand was graded up to ¼ inch and the coarse aggregate from the No. 8 sieve to the ⅜ inch sieve. A slight adjustment of these proportions was permitted but in no case was the coarse aggregate less than 1½ times the fine aggregate. Not more than 4 gallons of water, including that in the aggregate, was permitted for each sack of cement. Where severe wear was expected, the aggregate was trap rock, but in other locations pea gravel was used.

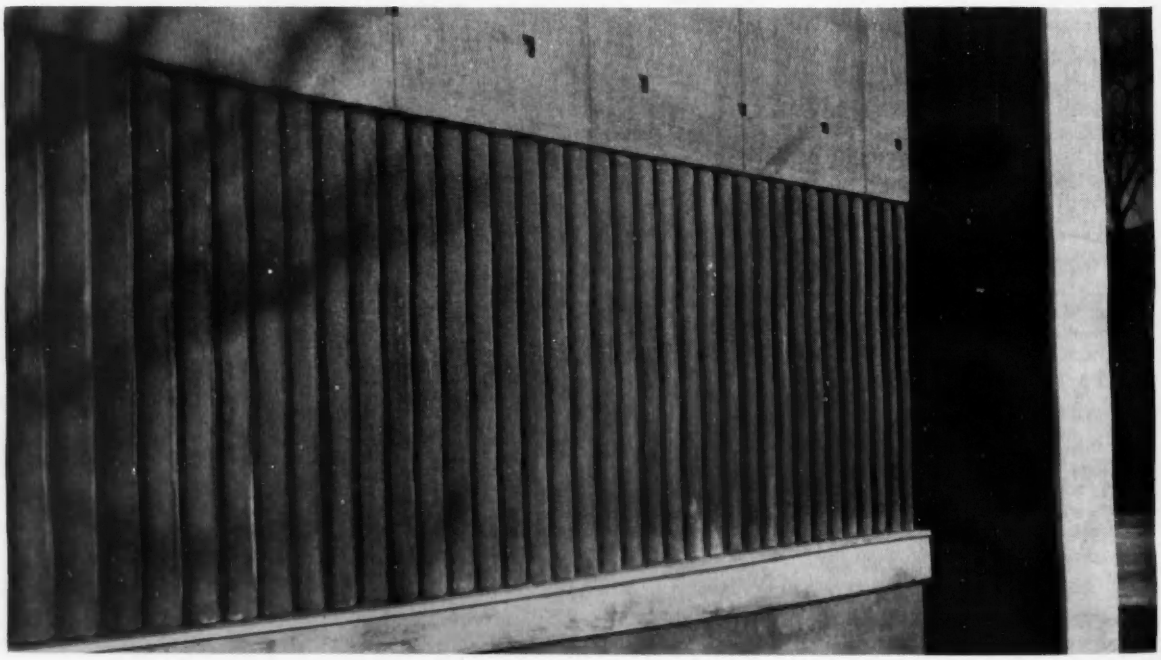
PRECAST ELEMENTS

The contractor worked out formwork details carefully on paper before beginning construction of forms for the site-precast structural elements. Special attention was given to location on prefabricated lifting inserts. This planning paid off in the minimum amount of trouble experienced in getting accurate forms built for the structural elements, which were repeated many times in the building.

Forms were constructed of plywood, coated with plastic in some instances, and edges were carefully dressed to minimize fins at panel joints. Most of the structural elements were cast in pairs, which simplified bracing since forms could be braced against adjacent forms on one side. Forms were re-used several times.

The main wall panels, 20½ feet wide, 30½ feet high and 8 inches thick, were cast on textured rubber form liners which were stapled to the bottom of the form. These form liners were re-used when possible. The top, or inside of the wall panels was given a broomed finish.

One of the fluted 5-foot high wall panels between the main wall panels and the spandrel beams. For an explanation of the textured surface above and below this panel see the illustration on the facing page.



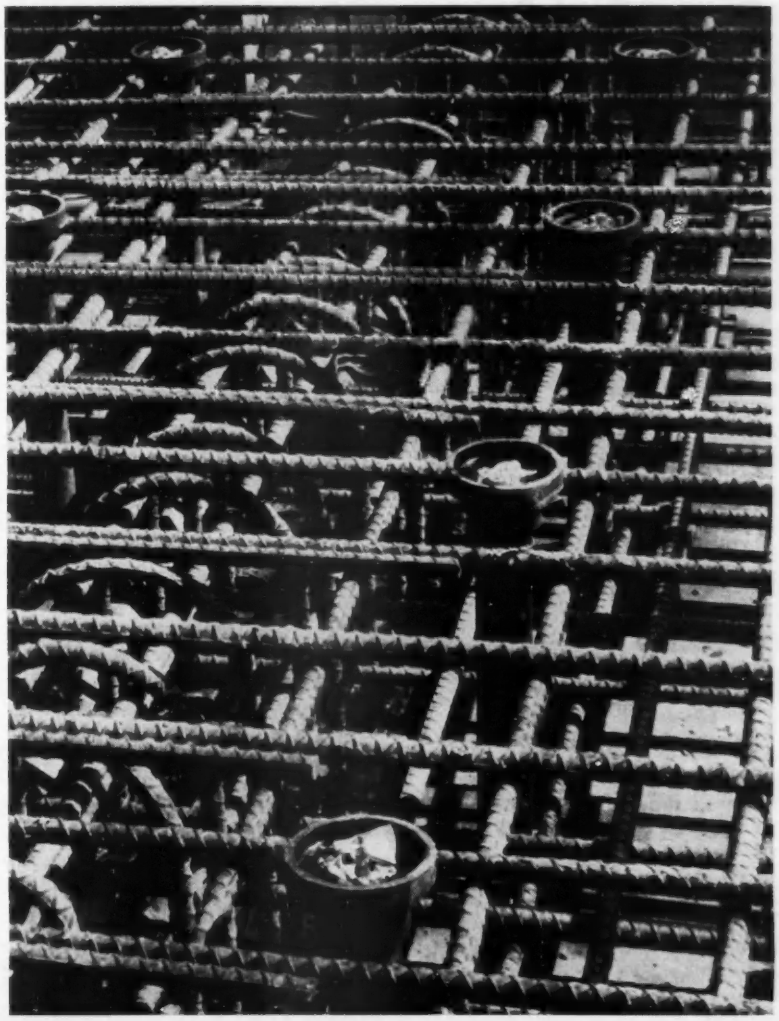
Smaller wall panels, about 5 feet high, form a decorative band between the main wall panels and the spandrel beams. Some of these panels are fluted and others reproduce relief sculpture.

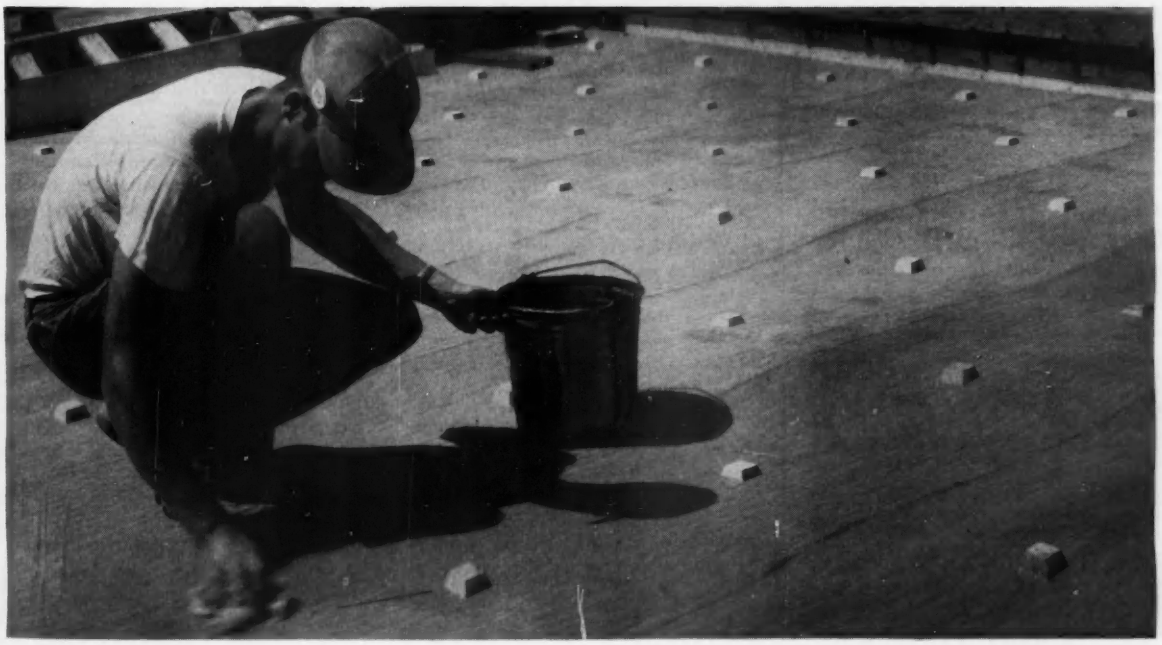
ERECTION OF PRECAST UNITS

Prefabricated inserts were used to provide lifting points on all units. The first units erected were the columns, which extend 4 feet 8 inches into heavily reinforced sockets in the foundation, and are cantilevered from these sockets. The columns were picked up and set in the sockets, then plumbed to an accuracy of ⅛ inch and braced. The space between the column and socket walls was filled with grout.

Next, the main wall panels were tilted or lifted into place. These panels overlap the columns by about 3½ inches and are fastened by clip angles. The smaller wall panels and spandrel beams were then erected. Spandrel beams are bolted to the columns.

The roof girders were lifted at third points and fitted into slots at the tops of columns. Ends of the girders were coated with a bituminous material to prevent bond, and the joint was grouted to make a tight fit. There is no rigid connection between





RIGHT: A small portion of the maze of reinforcing steel used in the box girder which forms the floor of the building. BELOW: Applying a stripping compound to the textured rubber form liners used for many of the wall panels.

columns and girders; the girders act as simply supported spans.

Hollow concrete roof slabs were placed and grouted and built-up roofing was applied. The crane girders were set on brackets cast in the columns. Reinforcement between adjacent girders was lapped and welded, and the space between girders was filled with grout. Crane rails are bolted to inserts set in the girders.

A 4-foot 8-inch wide observation balcony along one side of the building is supported by precast brackets attached to the columns by post-tensioning two high-strength bolts. The stairways at both ends of the building are also of unusual precast construction. The main stairway from basement to third floor offices is made of precast tread units supported on vertical concrete planks. The treads are dowelled to the planks. At the other end of the building is an unusual circular stairway from basement to the observation balcony. This stairway was built of precast tread units containing a hole at one end. A reinforcing cage was threaded through the holes, and the units were properly staggered and grouted. The resulting appearance is of treads cantilevered from a round central column.

ARCHITECTURE

In designing the new Structural Laboratory, the architects were faced with the problem of expressing the remarkable testing facilities inside a building which is essentially a large crane bay. The 38-foot high columns were left smooth as they came from the forms. A textural contrast is provided by the main 20- by 30-foot wall panels, which were cast on textured rubber form liners. The texture has a vertical emphasis, thus suggesting vertical support of the crane bay. The large wall panels also contain small square indentations arranged in a pattern of squares to add further interest to the surface.

Above these wall panels are 5-foot high precast panels which are ornamented with designs expressing the various aspects of testing materials for structural adaptability, compression, tension and flexure. The originals of these panels were modeled in clay by sculptor P. K. Kufrin. Plaster molds were made from the originals, and concrete was cast in these molds. The relief of the sculpture was kept low so that the plaster molds could be used repeatedly.

The sculptured panel in each bay is flanked by panels of vertical fluting, which repeat a motif used extensively in other buildings nearby.

At the main entrance are two remarkable examples of precast sculpture. These panels are 8 feet wide and 11 feet high, and were made in the same manner as the sculptured wall panels. The two panels suggest the process of manufacture of portland cement and its use in the building. On one side, raw materials are depicted dropping out of a stylized clam shell into a grinding unit, from which they are conveyed into a tank which feeds into a rotary kiln. The clinker coming out of the opposite end of the kiln is ground into cement, then conveyed around the edge of the panel to the opposite side.

Here it is combined with aggregate in a concrete mixer and cast in the form of columns, T-beams and slabs which are reproductions of the elements actually used in the building itself. A figure of a workman is superimposed on this panel to symbolize his control over the entire building operation.

Architecturally, there was a problem in integrating the three floors of offices and shops at one end of the building with the rest of the structure. Since the offices all open onto balconies overlooking the testing floor, and are therefore intimately related to it in the interior, it was decided to express this relationship on the exterior of the building without trickery or disguise. The office portion of the building is thus an extension of the crane bay, differing only in that it contains panels of windows.

The design chosen for the laboratory proved to be exceptionally economical. The entire cost of the laboratory building, including all equipment, loading devices, instrumentation, office furniture and even landscaping, was about $1 million. For this amount, PCA got a 10-million-pound testing laboratory of almost unlimited versatility and flexibility. In comparison, this amount could be expected to buy approximately the hardware and foundation of a single 5-million-pound testing machine of conventional design, on the basis of recent installations. Such a machine would have much more limited capabilities. This economy is another reason why the new laboratory may have a revolutionary effect on the design of structural testing facilities. END

Part I, which appeared in the October issue, covered types of treatment, appearance of finishes, maintenance requirements and conditions of exposure.

Part II of this three-part article deals with the materials used in external rendering and the types of background materials on which the rendering is applied.

EXTERNAL RENDERED FINISHED

(Part two of three installments)

INFLUENCE OF THE BACKING MATERIAL

The type of background on which the rendering is to be applied will influence the choice of material to be used and the methods of preparation and application. The types of background include brick (either burnt clay, sand-lime or concrete); burnt clay block; poured concrete or concrete block, with dense or lightweight aggregate; aerated concrete; no-fines concrete; and lathing, usually metal, fixed on a framework or grounds. Table 2 gives some indication of special requirements with these various types of background, and they are considered in more detail below.

Dense, strong and smooth materials. It may sometimes be difficult to get renderings to adhere properly to such materials as dense concrete, either precase or cast in place, or dense types of clay brick or clay block, because of their smooth surfaces and low porosity. A mechanical key provided by hacking the surface or by grooves formed during the manufacture of the units can be a useful safeguard with such surfaces. Instead of this, either a spatter-dash treatment can be given or, on particularly difficult surfaces such as dense concrete impregnated with oil, or on old work that has been painted or given water-repellent coatings, a light metal mesh can be secured to the wall by plugging and stapling to act as reinforcement. If a spatter-dash

TABLE 2
The Preparation and Undercoat Requirements for Rendered Finishes on Various Backing Materials*

BACKING MATERIAL	PREPARATION	SPATTER-DASH	UNDERCOAT
Poured concrete. Dense	Hacking sometimes necessary. On old or oily work fix wire mesh or expanded metal	Necessary	Any mix to suit finish
Poured concrete. Lightweight	None	Only necessary for severe exposure to wind and rain	Not stronger than 1:1:5-6
Concrete blocks. All types	Rake mortar joints	Useful with denser types	Not stronger than 1:1:5-6
Bricks. Very dense types (clay or concrete)	Rake mortar joints	Necessary	Any mix to suit finish
Bricks. Moderately strong but porous types	Rake mortar joints	Not necessary	Any mix to suit finish
Bricks. Moderately weak types	Rake mortar joints	Should not be used	Not stronger than 1:1:5-6
Clay blocks	Rake mortar joints	Necessary with some types	Any mix to suit the type of block and the finish
No-fines (single-sized aggregate) concrete	None	Should not be used	Any mix to suit finish, but only of sufficient thickness to bind and level surface
Wood-wool building slabs	Chicken wire fixed to slabs an advantage; otherwise metal scrim over joints	Should not be used	1:3 cement:sand or 1:1:5-6 cement:lime:sand

*This table deals only with solid backings and with new work. Reference should be made to the text for work on metal lathing or on old work.

coat is used the normal mix dictated by the exposure conditions and type of finish should be chosen for the undercoat and finish, but if the spatter-dash is omitted a stronger mix is sometimes considered to be preferable for the undercoat.

Moderately strong porous materials. The more porous but moderately strong materials, including most clay brick, sand-lime brick, and concrete or clay block, have fairly high suction and afford a good mechanical key for renderings. They can usually be rendered without difficulty, but if the suction is high or irregular a spatter-dash coating may be useful. Joints in brickwork or block construction should be raked, except where a spatter-dash treatment is to be used. Cement : lime : sand mixes are the most suitable as rendering coats on these materials.

Moderately weak porous materials. The weaker porous materials, such as concrete made with lightweight aggregate (pumice, foamed slag, clinker, etc.), aerated concrete, and some rather soft types of brick, generally offer no difficulty in application or adhesion of a rendering. It is important, however, that the rendering should have a lower strength than the material on which it is applied, as otherwise the drying shrinkage of the rendering is likely to set up stresses sufficient to tear off the surface of the backing material, with resultant cracking and failure of the rendering. The mix should be of the cement : lime : sand or hydraulic lime : sand type, with as low a cement content as the exposure and other conditions will allow.

Lightweight concretes vary widely in strength according to the mix proportions and the type of aggregate; some may be sufficiently strong to be rendered with any type of mix, but it is usually advisable to regard them as falling into the moderately weak class of background unless experience has shown that stronger mixes may safely be used.

No-fines concrete. No-fines (single-sized aggregate) concrete is peculiar in that it has a large proportion of voids but has practically no suction. The open structure however gives a good mechanical key and the material is strong enough not to be broken up by shrinkage stresses if the thickness of rendering applied is not too great. The type of mix used depends upon the finish required. The rendering should not be thicker than is necessary to bind and level the surface with the first coat, and to attain the required finish with the second coat; since there are no fine pores to cause suction, there is no need for the rendering to be completely damp-proof, and water will penetrate into the wall only through holes, cracks, or faulty detailing of the structure.

Metal lathing. In using metal lathing the more important points influencing the choice of rendering material and finish are the risks of corrosion of the metal and of cracking of the finish. Portland cement and lime both help to protect steel against corrosion, the protection being rather greater with mixes richer in cement, owing to their lower permeability to moisture. On the other hand, the risk of major cracks forming is greater with the mixes rich in cement. Accordingly, it seems preferable to cover the steel mesh with a first coat of a 1 : 3 mix of portland cement and sand on those types of lathing which provides a relatively rigid reinforcement, e. g., expanded metal or perforated metal, but to use a 1 : 1 : 6 cement : lime : sand mix for the first coat on those types which consist of a wire mesh giving less rigidity. The subsequent coat or coats may then be of the mix most appropriate for the type of finish required, but should not be stronger than the undercoat.

The use of hair in the first coat probably helps when applying rendering on lathing which has no solid backing. When lathing is fixed over a frame construction in such a way that the back can be made accessible, it is highly desirable to render the back of the lathing in order to reduce the risk of early rusting of the metal. It is impossible to protect metal lathing completely by rendering on one face only, and there must always be some doubt whether early deterioration may not ensue under such conditions.

MATERIALS

The materials used in external renderings are cement (usually portland cement), lime (either dry hydrate, or quicklime run to putty), and fine aggregate (natural sand or crushed stone sand or more rarely by-product materials of various types). Each of the materials is important, but it is probably more difficult to insure that the aggregate is suitable than to insure good quality cement or lime.

Aggregate. Generally it is advantageous for scraped, smooth or roughcast finishes to use sand as coarse as can be applied. Finer sands will often be preferred by the plasterer, because they are easier to apply, but they are more likely to give rise to crazing and shrinkage cracking, and they give less pleasing finishes. The patterned types of textured finish, such as ruled finishes and fan pattern finish, require finer sands, giving a more fatty mix, than the rougher types such as scraped or cottage textures. A finer sand is also an advantage for pebble-dash as it holds the dry pebble or stone better when thrown. For undercoats in general a finer sand is permissible than for the finishing coat. Sands for rendering should have low clay contents and be free from organic matter. They should not contain any soluble salts, particularly when used on metal lathing.

Crushed stone sands for renderings should comply with the same requirements, although some recent work suggests that crushed limestone sand may contain higher proportions of fine material without causing any trouble.

For roughcast (wet-dash or "harling") a crushed stone or fine gravel up to ½ inch maximum size may be used in the finishing coat. The grading and maximum size will vary according to the texture required and the type of stone; an aggregate of the desired grading may be obtained either by using a mixture of stone or gravel with sand, or by using crushed stone graded from the maximum size down to dust. The proportion of coarse material (over 3/16 inch) to fine should be about 1 : 2.

For the pebble-dash finishes pea shingle, spar, crushed hard limestone or marble chippings or other crushed stone of suitable appearance, in a ¼- to ½-inch grading, should be used.

Cement. The cement used as a binder in rendered finishes may be regular Type I portland cement or Type III high-early-strength cement. High-alumina cement mixes are also sometimes used on work from which moisture cannot be completely excluded and which has a background containing soluble sulfates. When the latter type of cement is used for rendering over unit masonry, it is of the utmost importance that the jointing mortar be of the same type.

Lime. Lime may be used in the form of quicklime, which must be properly slaked on the site, or in the form of dry hydrated lime, which does

not require slaking before use. The so-called "Roman cements" are in effect eminently hydraulic limes with a high proportion of hydraulic constituents and a correspondingly small proportion of free lime. They are sold in a finely-ground condition and are used without slaking. The methods of preparing the material and mixes vary with the type of lime, and the facilities and time which will be available should be taken into consideration in specifying the type to be used.

Pigments. The essential requirements are that the pigments shall be stable and unaffected by exposure to light or to alkali or lime, and that they shall contain nothing having an adverse effect upon the cement. One of the most difficult problems in connection with pigments is that of insuring complete and uniform distribution of the pigment in the mix and of insuring identical amounts of pigment in different mixes.

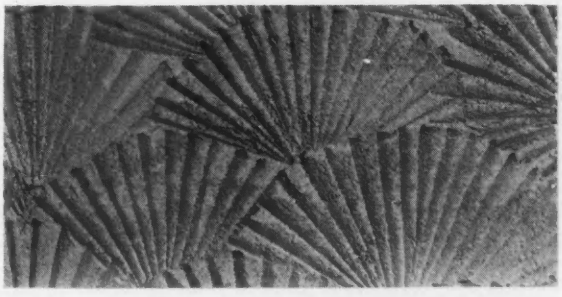
Ready-mixed materials. A variety of ready-mixed rendering materials are available, needing only to be mixed with water before use. They contain the cementing agent, carefully graded aggregate and, where required, pigments and water-repellents, Ready-mixed materials are used widely in some countries, and provided the materials and mixes have been properly chosen, their use is to be commended. Advantages are that there is only one material to use, instead of having to mix several together; correct composition is insured, as well as proper grading of the aggregate and uniformity—particularly of color—between one batch and another; and the convenience of being able to obtain colors, textures and other characteristics that might otherwise be difficult.

To be continued in December 1958 issue

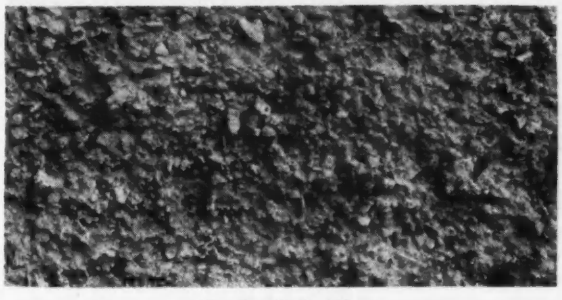
Pictorial Summary of External Rendered Finishes

Pebble-dash

Fan Texture

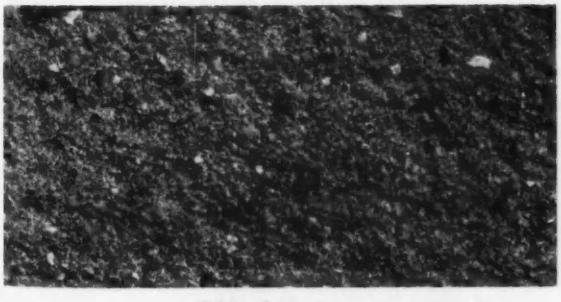


Roughcast or Wet-dash



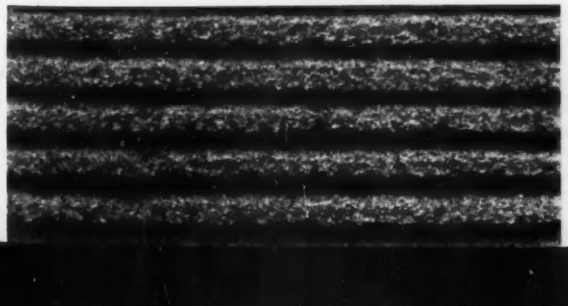
English Cottage Texture

Scraped Finish

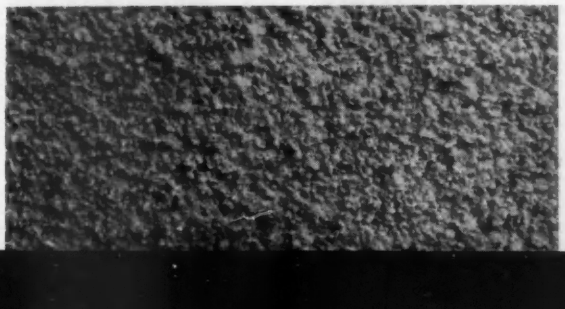


Course Texture (machine-applied)

Ribbed Texture



Medium Fine Texture (machine-applied)



In the finishing stages the outer skin of the concrete was removed with hand tools. Color harmony between the concrete and the limestone of earlier centuries was achieved through careful mix design.

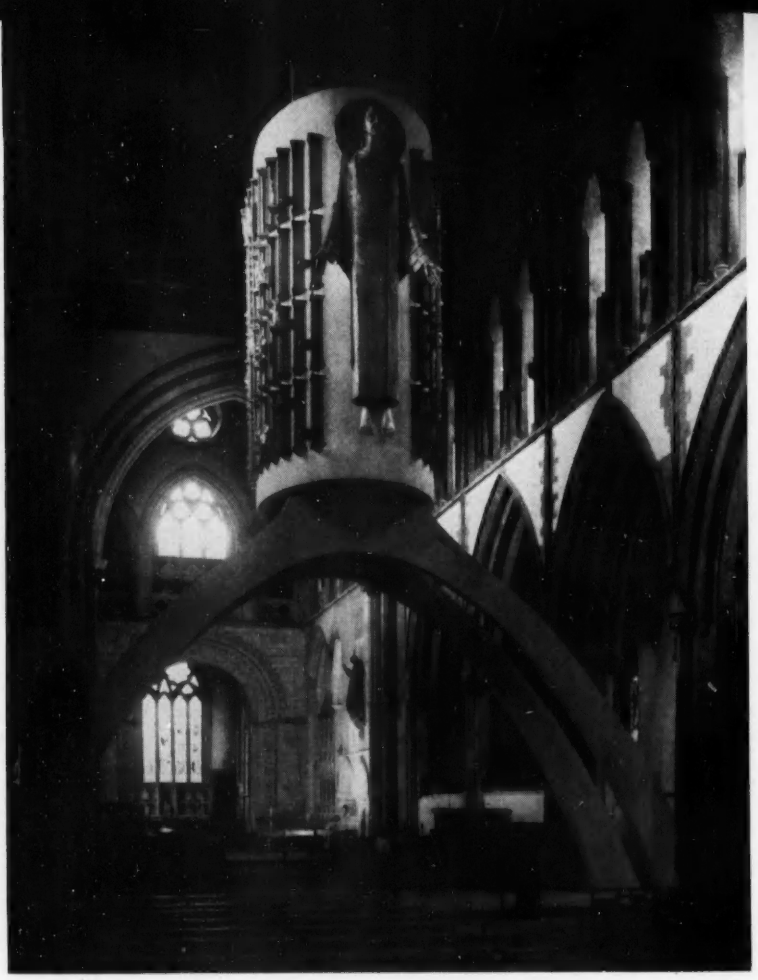
Photo courtesy Cement and Concrete Association

Reinforced Concrete Craftsmanship in a 12th Century Cathedral

WHILE THERE ARE THOSE who would argue that reinforced concrete could have no possible place in the exposed areas of a cathedral that dates back to the 12th century, nevertheless this modern material has been used with good effect in the restoration of Llandaff Cathedral in England. The new work in this medium has achieved complete esthetic harmony with eight centuries of craftsmanship, while at the same time it has carried on the tradition which has permitted each period to place its own stamp upon the total structure.

The most striking addition to Llandaff, made in connection with an extensive repair project necessitated by World War II bombings, is the dramatic reinforced concrete pulpitum pictured on these pages. It consists of a parabolic arch, 25 feet high, springing from the bay spacings on either side of the Cathedral and completely spanning the nave. At the apex of the arch a concealed platform carries the echo organ.

Although no deliberate effort was put forth to make the concrete of the arch to resemble stone, it was considered of the utmost importance that in color and texture it should harmonize with the limestone that predominates throughout the structure. To accomplish this the Cement and Concrete Association (the British equivalent of our Portland Cement Association) devised a special mix with the following proportions by volume: 1 part white portland cement plus 5 percent by weight of khaki Colorcrete; 1½ parts Derbyshire spar, grade B, minus 1/10 inch; 3 parts portland stone passing ⅜ inch and retained on a 3/16-inch sieve. (MORE)



RIGHT: Completely at home amid the Gothic arches built by early craftsmen, the new reinforced concrete organ arch in Llandaff Cathedral provides a dramatic link between the present and the past.

LOWER RIGHT: This close-up view shows the finer texture of the concrete surface achieved with mechanical tooling in contrast with the coarser texture that resulted from hand tooling alone.

Since the arch carries relatively little weight, the designers had specified a crushing strength of only 1,000 psi. at 28 days. The mix proportions outlined above actually yielded concrete with a crushing strength of 4,700 psi. at 7 days.

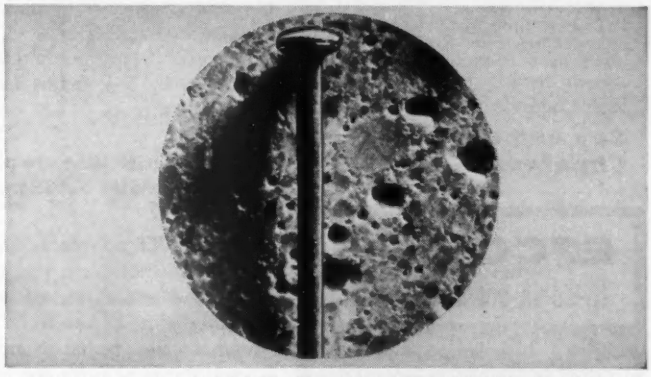
The arch was first hand tooled and the outer skin of concrete removed. Since it was thought that the resulting texture was somewhat coarse, mechanical tooling was eventually undertaken to obtain a finer grained finish. The accompanying photographs show the textures obtained in this two-stage finishing operation.

The concrete arch has been criticized as being "out of place" in what is essentially a Gothic cathedral—another way of arguing that concrete, used as concrete and not concealed, has no place in a stone building. In other centuries, however, the builder has shown little evidence of a similar historical conscience, choosing instead to impress the spirit and mood of his era upon all his work. By their bold use of a design and a material both firmly rooted in today, the restorers of Llandaff have helped perpetuate a noble tradition. END

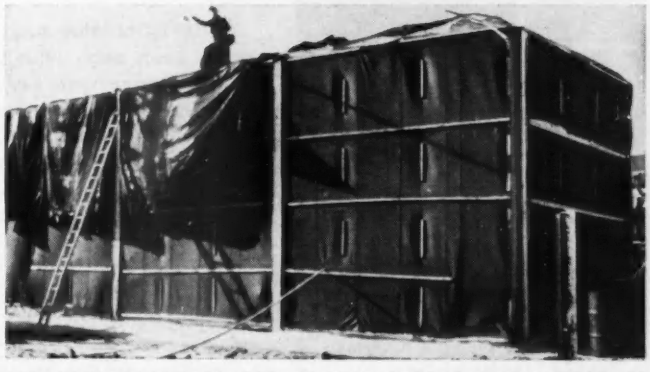
3 points to watch for better winter concreting

1. Plan ahead. Concrete will be delivered at a temperature between 50° and 70°F. Be ready to place at once. Have forms and reinforcing steel free from ice and frost—live steam works best. And, of course, never place concrete on frozen ground. It will settle when it thaws.

2. Specify air-entrained concrete for all jobs—structures and pavements. Resistance to freezing and thawing is greatly increased—freezing water in the concrete has room to expand harmlessly into the air cells. Magnified photo shows size of air cells compared with ordinary straight pin.



3. Provide suitable curing temperatures. Use protective coverings as needed, either with or without moist heat, to keep concrete at 70° or above for 3 days, or 50° or above for 5 days. Protect from freezing for at least 4 days. Rate of cooling concrete shouldn't exceed 1 or 2 degrees per hour.



quality concrete

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PORTLAND CEMENT ASSOCIATION

Dept. 10-98, 33 West Grand Avenue, Chicago 10, Illinois

A national organization to improve and extend the uses of concrete

Circle #812 on mailing card

questions and answers

QUESTION: What is the distinction between the terms "workability" and "placeability" as applied to concrete?

ANSWER: They are essentially the same. There is no absolute basis of measurement for either of these terms, although slump values have a clear relationship to workability.

QUESTION: Are the epoxy resins being used at all in connection with increasing the skid resistance of concrete?

ANSWER: At least one material is being used for this purpose. It is being marketed under the trade name Relcote by Reliance Steel Products Co. of McKeesport, Pennsylvania. It consists of a surfacing course of abrasive aggregate in combination with a synthetic epoxy resin binder. It is applied over either new or old pavements in thin layers ranging down to 1/16 inch. Test results are said to be most promising.

QUESTION: Why are piers placed in drilled holes considered superior to others?

ANSWER: Probably the most important advantage is that the concrete is placed in undisturbed soil, with the result that it is likely to be more stable and is almost bound to sustain heavier loads due to skin friction.

QUESTION: Has any additional work been done with prestressed concrete pavements since the Jones & Laughlin project you reported some time ago? (Concrete Construction, July 1957, page 3.)

ANSWER: Yes, a section 500 feet long and 50 feet wide was completed recently as part of an experimental heavy-load test tract for the Ohio River Division laboratories of the U.S. Army Corps of Engineers.

QUESTION: Has there been any tendency for construction wages to level off this year?

ANSWER: Apparently not, although the gains in some areas have been less than usual. In general construction workers in 1958 appear to have won the largest wage increases since 1953.

QUESTION: What are the principal factors which affect the ability of concrete to resist abrasion?

ANSWER: Tests conducted by the Bureau of Reclamation show that abrasion resistance varies directly with compressive strength and cement content and inversely with water-cement ratio, regardless of aggregate quality or combinations of aggregates used. Oddly enough, these same tests showed no significant relationship between the quality of coarse aggregate (as determined by either the sodium sulfate soundness or the Los Angeles abrasion tests) and the resistance to abrasion of concretes containing these aggregates.

QUESTION: Is corrosion a serious problem when aluminum is embedded in concrete?

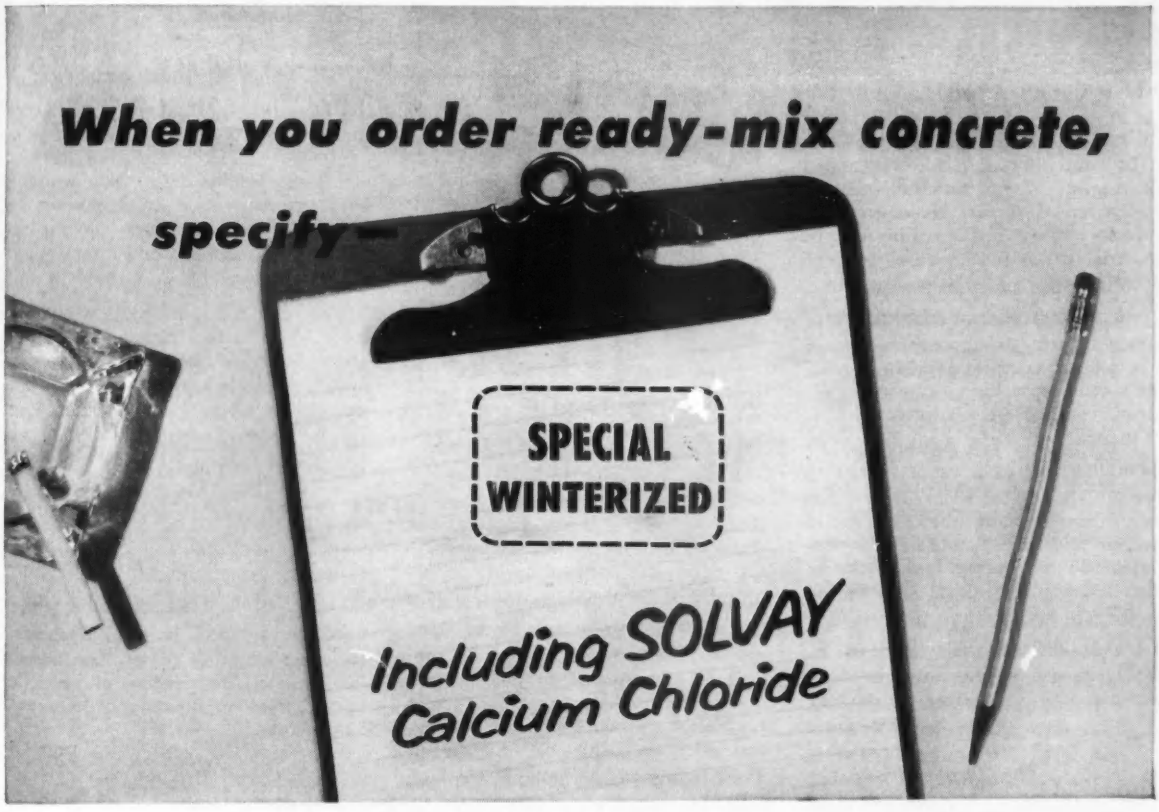
ANSWER: It is generally believed that exposure to wet concrete causes only a very mild corrosion in aluminum during the setting period. There seems to be very little reaction between concrete and aluminum after the concrete has set, and cases of severe attack are extremely rare.

QUESTION: How many of the states either require or permit the consolidation of pavement concrete by vibration and what slumps are specified?

ANSWER: According to data presented at the annual convention of the National Ready Mixed Concrete Association in Chicago last winter, 26 states now require or permit the vibration of pavement concrete. While the maximum permissible slump varies somewhat from state to state, over 90 percent of the specifications permit a maximum slump of 2 inches or less for vibrated concrete.

QUESTION: In measuring slump, is it correct to measure down to an average, or should the measurement be taken to the highest point?

ANSWER: ASTM specifications are quite clear on this: The measurement must be taken to the highest point on the concrete, even when a single piece of aggregate projects well above the rest of the material.



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Circle #817 on mailing card

letters to editor

Not a Curing Agent?

Sir:

In your very excellent publication of August, 1958, I was interested in the letter of G. H. Hennegar with reference to a sodium silicate type material which is claimed to be both a curing and hardening agent.

As manufacturers of membrane type concrete curing compounds, we would like to take exception to Mr. Hennegar's claim that the silicate type material will perform a curing function.

In order to cure, a surface treatment must act as a vapor barrier to prevent the loss of water by evaporation, thus allowing the concrete to hydrate and "cure." Silicate type materials do not prevent the loss of water during the critical early curing period.

Unless the material described by Mr. Hennegar has the ability to retain water, it will not perform as claimed.

M. J. MURPHY
President
The Murphy-Phoenix Co.
Cleveland, Ohio

And Obsolete, Too?

Sir:

Occasionally I notice a communication in your "Letters to Editor" column which causes me to raise an eyebrow because it is so obviously a blurb disguised as a letter.

An instance of this in your August issue. I refer to the letter from the Walter Maguire Company, which you headed with the title "New Curing Agents."

I was grinning from ear to ear when I read the words ". . . one of the newest types of chemical curing agents, namely the sodium silicate variety. . . ."

Newest indeed! Sodium silicate or "waterglass" as it is commonly called, as a curing medium for concrete is not only old, it is obsolete. The best reference is the largest manufacturer of sodium silicate in this country, namely, Philadelphia Quartz Company. The use of sodium silicate as a concrete hardener goes back at least a half a century. I shall not take the time to deflate some other statements in the Maguire letter, since they merely belabor the obvious.

Mind you, not that I am opposed to the use of sodium silicate as a concrete floor treatment. After all, it has been used for many, many years as an egg preservative. Naturally, if it was good for the limestone shell of an egg, it should function at least as well with the surface of a concrete floor. But, as a curing compound, that's another matter.

LEO LIBERTHSON
Technical Director
L. Sonneborn Sons, Inc.
New York, N. Y.

On The Other Hand

Sir:

It was gratifying to learn that my letter in the August issue of Concrete Construction has "drawn fire from two sources." Mr. Murphy's statement to the effect that proper curing is accomplished by thorough water retention is, of course, quite accurate. Our product, Emeri-Crete Kure, does prevent evaporation, as attested by laboratory tests showing a water retention, after 24 hours, of 96.3 percent, and after six days of 91.8 percent. These figures will be found to compare most favorably with those for the water retention of membrane type curing compounds.

Moving to the other letter, Mr. Liberthson states that the use of sodium silicate as a curing compound is not "new" and is, in fact, obsolete. This is very possibly true, and it is likewise apparent why sodium silicate, as such, would not provide especially effective curing. Naturally we are very familiar with the fact that sodium silicate has been used as a liquid hardener for cured concrete for many, many years. So, instead of my original statement to the effect that sodium silicate curing compounds were relatively new, I should have said that there is a relatively new special formulation of a sodium silicate based curing compound, incorporating a non-acid detergent penetrant.

In short, our product has taken advantage of the merits of sodium silicate as a liquid hardener and incorporated them in a chemical curing agent, accomplishing both functions in a single application. In final analysis, the proof of the pudding must always be in the tasting.

G. H. HENNEGAR
Executive Vice President
Walter Maguire Company, Inc.
New York, N. Y.

That Black Stuff

Sir:

The article on Thin Bonded Resurfacing (July 1958, page 5) is very interesting. We are pleased to note that thin bonded resurfacing has become accepted practice. We wonder, however, why it is so important to restore concrete "without having recourse to materials other than concrete."

Chemical bonding agents would reduce the "rather large number of steps . . . required for this topping technique." Perhaps in your follow-up articles on new developments in this field reference can be made to our method of bonding.

DOROTHY V. FISHOW
Public Relations
Larsen Products Corp.
Bethesda, Md.

In referring to materials other than concrete, we had in mind asphaltic surfacing materials rather than chemical products the purpose of which is to facilitate the bonding of concrete to concrete.

EDITOR

Too Much to Study

Sir:

I have been going over the September issue of Concrete Construction magazine and certainly want to thank you for the fine treatment accorded us and the rest of the membership of the American Council of Independent Laboratories in the directory of testing laboratories for concrete construction materials.

The entire magazine was very readable, and our soils man thought the second installment of "Soil and Soil Mechanics," was a very good idea, but we do question the last sentence under figure 4, which states, "soil conditions should be studied to a depth of at least twice the width of any structure which is to be placed on the soil." We believe this would be interpreted to mean 500 feet for a building 250 feet wide.

LEWIS F. HERRON
President
Herron Testing Laboratories, Inc.
Cleveland, Ohio

We suspect the author of our article on soils meant to urge that conditions be studied to a depth at least twice the width of any structural element (such as a footing) resting on the soil.

EDITOR

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Leschen Prestressing Strand is produced by a new continuous flow technique in today's most thoroughly modern wire mill. It was designed, built and equipped specifically to meet or beat the industry's most exacting specifications.

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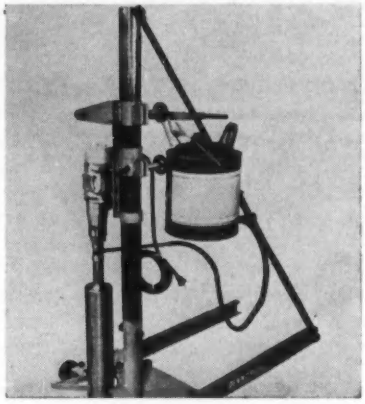
Circle #811 on mailing card

equipment tools and materials

Additional free information concerning these items may be obtained by mailing the reader service card located between pages 16 and 17.

Masonry Drill

One-half to 9½-inch diameter holes through concrete walls and floors can be drilled with this portable electric drill using diamond coring bits. One contractor drilled 2½-inch holes for



outlets at a diamond bit cost of less than 20 cents per hole, and spent less than 5 minutes to set up and drill each hole. **Pennsylvania Drilling Company, Masonry Drill Division, 1201 Banksville Road, Pittsburgh 16, Pennsylvania.**

Terrazzo Surfacing Machine

A new model terrazzo grinding machine, the Terrco Ten, is a 10 H. P., 1,191-pound heavy duty machine which will produce high quality, level terrazzo surfaces according to the manufacturer. Twenty-four stones arranged in four discs make fast, effective performance. Write **Terrazzo Machine and Supply Company, 2536-24th Avenue S., Minneapolis 6, Minn.**

Form Compound

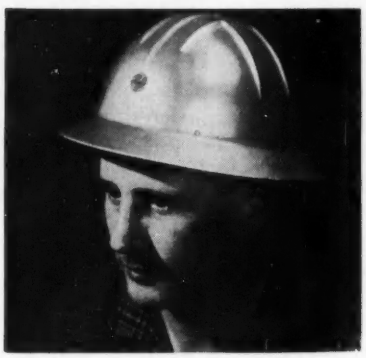
A new form release agent permits quick stripping of concrete members, leaves concrete with a glossy, almost marblelike surface and does not build up on the forms, according to the manufacturer. These qualities make it suitable for architectural as well as structural grades. Ordinary spraying equipment is adequate for application to steel and wood forms for all types of prestressed structural members. It is particularly suitable for production of architectural grade beams where clean, unmarred surfaces are mandatory. It does not stain, and will not interfere with concrete paints and coatings. Write **Shell Oil Company, 50 West 50th Street, New York 20, N. Y.**

Dispersing Agent

Kemic is a complex blend of inorganic compounds reacted to form a gelatinous precipitate for use in concrete and other cementitious materials. It is said to separate cement particles, and plasticize and expand each particle, producing easily worked concrete which does not segregate or bleed. The material accelerates setting in cold weather and retards it in warm weather. By reducing some of the causes of shrinkage, Kemic minimizes cracks and checks, it is claimed. Write **Kemic Company of Illinois, 1113 Lee Street, Des Plaines, Ill.**

Safety Hat

This aluminum safety hat exceeds Federal specifications for construction workers' hats, including both impact resistance (drop ball test) and penetration strength (plumb bob test), passing all requirements except for



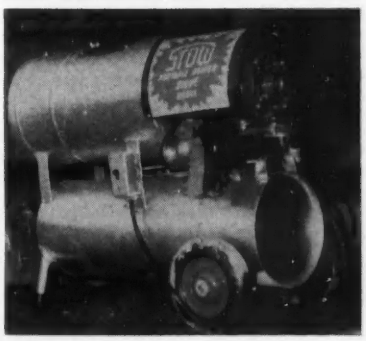
insulation resistance. The six-point suspension headgear is a soft and pliable unit, shock absorbent and comfortable. Chin straps and winterliners are available. **Jackson Products, 31739 Mound Road, Warren, Michigan.**

equipment and tools

For additional free information mail card facing page 16.

Motor-in-Head Vibrator

The design of this high frequency electric vibrator eliminates handling of heavy flexible shafts or power units. Only the vibrator goes up on the form. The portable generator may be spotted anywhere within 200 feet of the vibrator. Necessary variations in power are obtainable because the vibrator speed is directly dependent on generator output. **Chicago Pneumatic Tool Company, 6 East 44th Street, New York 17, N. Y.**



New Portable Heater

Designed especially for the construction industry, this recirculating oil-fired portable heater features a built-in room thermostat which automatically turns the heat on and off to maintain any desired constant temperature. Other features: automatic electric ignition, an electrically driven fan, and an enclosed combustion chamber that completely burns the fuel. **Stow Manufacturing Company, 354 Shear Street, Binghamton, N. Y.**

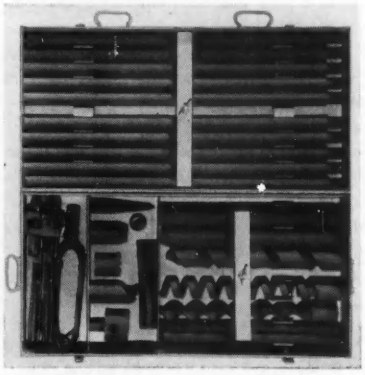
equipment and tools

For additional free information mail card facing page 16.

Portable Conveyors

Easily carried on car, trailer or pick-up truck, these models of Palmer E-Z-Lift conveyors feature strength, easy handling and low price. Complete with engine, E-Z Lifts operate from 0 to 60 degrees, move 720 units or from 20 to 30 cubic yards per hour of either solids or bulk materials. **A. Palmer Scaffolding Company, 3928 San Fernando Road, Glendale 4, California.**

Soil Sampling Kit



This collection of tools for the recovery of accurate samples from practically any formation is packed in a steel box for easy carrying. Acker Kits are used for proving and testing sand, clay, gravel, mineral, coal and similar deposits, preliminary foundation test borings, soil sampling and for testing for highway sites and airport runways. **Acker Drill Company, 725 West Lackawanna Avenue, Scranton, Pennsylvania.**

Dodson's Digest

A la carte(r)

A garage builder had just opened for business, and I called on him to tell him about Calcium Chloride.

"Name's Dodson," I greeted him as I entered. "Like to talk about . . . "

"Mine's Carter — Bill Carter," he interrupted. "You've come at a bad time. Never again will I start a garage business in the winter!"

"No better time to tell you about Calcium Chloride," I explained, handing him my card. "When you lay your concrete slabs, Calcium Chlor - - - "

"Hold it a minute, Dodson," he broke in. "I'm up to my neck in capital outlays. If you've got something that'll put change in the old purse, okay. If not, see me next summer."

"Well, Mr. Carter," I said, "I've been around long enough to know that anyone just starting up has his hands full! I wouldn't bother you if I didn't think Calcium Chloride could do you some good!"

"Go on then," he consented. "But hurry. Got a lunch date in ten minutes."

"As I started to tell you," I continued, "you'll save by using Calcium Chloride in your concrete mix. Reduces set-time by two-thirds, so your crew leaves the job sooner. You cut down on fuel and canvas. Gives the concrete higher early *and* final strength! Prevents freeze-ups — and there's less chipping and cracking."

"Okay, okay, Dodson," he replied. "I'll consider it."

Just then he opened a drawer and took out a lunch sack. "Hey!" I laughed. "Thought you had a date!"

"I do!" he replied, grinning. "Here, have a sandwich!"

— L. D. Dodson

P.S.—If cold weather is eating away your profits, send for your free copy of our booklet, "How To Make Better Concrete Products and Ready Mix." *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

equipment and tools

For additional free information mail card facing page 16.

Curing Agent

Clear Bond is a colorless, quick drying liquid membrane curing compound that is applied to concrete as soon as it has been troweled. It may also be used to harden and seal old floors. It penetrates into the pores of the concrete to bind together the particles of aggregate and cementitious material and forms a seal on the surface that prevents moisture from escaping. The manufacturer states that it provides an easier method of curing concrete than with wet straw, sawdust or burlap. It is said to seal out construction stains and materially reduce the cost of clean-up work, and since it penetrates and seals from within the surface it leaves no surface film to yellow and wear with age. Write **Guardian Chemical Company, P. O. Box 1354, Atlanta 1, Ga.**

Concrete Saw

Fast, precision adjustment of the blade sawing line to adjust for variations in hardness of the aggregate, cutting differences in blades, and sawing on curves or slopes are cited by the manufacturer as features of the new Target 368 self-propelled concrete saw. The operator has fingertip control of cutting speeds of 1 to 25 feet per minute while the saw is in motion. Roller wheels are all inside the cutting line of the blade to permit sawing close to curbs, walls and bridge abutments. Write **Robert G. Evans Company, 6024 Troost, Kansas City 10, Mo.**

Tilt-Up Accessories

A complete line of tilt-up accessories for lifting and anchoring precast concrete slabs has been added to Dayton Sure-Grip and Shore Company's line of concrete accessories. They are designed on the same principle as Sure-Grip coil ties, with connecting wires electrically pressure welded to the helix coil. Write **Dayton Sure-Grip and Shore Company, Miamisburg, Ohio.**

equipment and tools

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Form Ties

New Lov-Lok FP (Fast Pour) Snapties feature in-place washers which eliminate costly hand positioning, necessary when using loose washer ties. Also, because they rotate, in-place washers do not spall large sections of concrete when ties are broken back. The marking of each tie with wall thickness eliminates the expense for measuring ties. Another money saving feature is the easy breakback. Manufacturer states the FP Snaptie has increased safety factors due to the "no-pop" heads and because they are designed to withstand concrete pressures up to 5500 lbs. **Lov-Lok Form & Hardware Co., 9215 Cherry St., Franklin Park, Ill.**

Curing Blanket

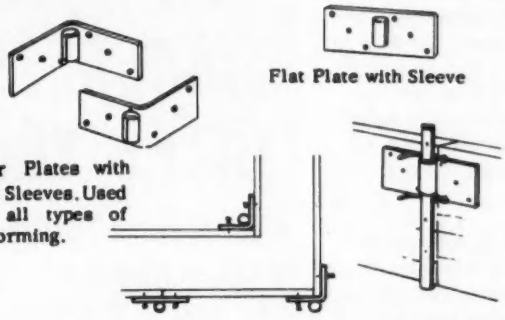
On a winter construction project in Indianapolis Maka Insulated Concrete Curing Blankets, made with 1-or 2-inch fiberglass encased in Visqueen Film, (polyethylene) were laid on freshly poured concrete for a period of four days. With the outside temperature at 3 degrees above zero, a slab temperature of 38 degrees was reported. Write **Max Katz Bag Company, 312-16 South New Jersey Street, Indianapolis 4, Ind.**

Masonry Finish

A dry mix of portland cement and marble, Seablue White Marble Mix produces a hard white finish requiring a minimum of maintenance. It is recommended for swimming pools, interior or exterior walls and all other masonry surfaces. It requires only water. Average application is 18 to 22 pounds per square yard, according to the surface. It is said to be easy to handle, involving no waste and having excellent shelf stability. It is applied with a steel trowel, allowed to set about 30 minutes and rubber floated or troweled out to desired finish. Write **Paddock Seablue Pool Equipment, Paddock of Texas, Inc., P. O. Box 7071, Dallas, Texas.**

equipment tools materials

Additional free information concerning any item described in these columns may be obtained by filling out and mailing the postage-free reader service card located between pages 16 and 17 in this issue.



Joiner Plates with Stake Sleeves. Used with all types of low forming.

Form Joiner Plates with Sleeves

A steel plate having a series of nail holes in it is welded to a sleeve that fits over the standard Dee nail stake. It is used very effectively at the form joints when setting up flat work, footings, curbs and other types of low forming. It maintains alignment and provides rigid support of the form boards at the joints, preserves the ends of the form boards by minimizing damage and only one stake is required where the forms butt. The latest innovation of this unit is the bent plate with the sleeve used to support and align the forms at the inside and outside corners. **Dee Concrete Products Co., 670 N. Michigan Avenue, Chicago 11, Ill.**

Concrete Admix

A liquid chemical additive for all concrete and mortar mixes, Sika-Set, has been introduced for the contracting, maintenance and ready-mix industries. It is said to increase durability and water resistance of concrete and mortar and accelerate hardening action. Forms may be stripped sooner and re-used more frequently and early floor finishing reduces or eliminates overtime finishing costs. The optimum quantity of air entrained by Sika-Set improves placeability and increases frost resistance. **Sika Chemical Corporation, 35 Gregory Avenue, Passaic, N. J.**

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Safety publications. Two new pamphlets are now available, one entitled "We Know Better," devoted to industrial safety and the other entitled "Your Future—Keep It Clean," devoted to good housekeeping in the factory. National Safety Council, 425 North Michigan Avenue, Chicago 11, Illinois.

P. S. I. calculator. A handy, pocket-sized p.s.i. calculator for making concrete compression tests, with instructions printed on the front cover, is available from Forney's Inc., Tester Division, P. O. Box 310, New Castle, Pennsylvania.

Water repellents. A chart lists an extensive line of integral water repellents for concrete, transparent water repellent liquids for concrete and masonry surfaces, corrective waterproofing, patching and repair materials, asphalts, concrete floor hardeners, nonslip aggregates, coloring and curing compounds, and maintenance products for patching, resurfacing, caulking and painting. Complete descriptions and information on how to use accompany each of the materials in the list. Ceresit Waterproofing Corporation, 3227 South Shields Avenue, Chicago 16, Ill.

Cementing compound. A folder explains clearly the cause of shrinkage cracks in concrete and tells how adding Berylex Cementing Compound to the mix makes a plastic, easily handled mix with less water and reduced shrinkage. Dusting, crazing, curing and bonding are also discussed. Illustrations show how to get the best results from each finishing operation and some common errors to avoid in placing and finishing. Form 207-B is available from Berylex National Sales, Division of Harry Warde and Company, Inc., P. O. Box 33, Kansas City 3, Kans.

Forms and accessories. "Products for Concrete Construction" is the title of catalogue No. 758 in which this firm's line of forms, form ties, accessories, construction specialties and highway products are clearly and completely described. Photographs illustrate the equipment. Universal Form Clamp Company, 1238 North Kostner Avenue, Chicago 51, Ill.

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Product directory. The product listing in this folder has been divided into major sub-groups which include welded wire fabric, prestressed concrete strand, tie wire, door and gate hardware and industrial and residential fencing, as well as all other products manufactured by this firm. Colorado Fuel and Iron Corporation, Continental Oil Building, Denver, Colo.

Architectural drafting. A home study course in architectural drafting, written by Professor Watkins of Ohio State University and architects and engineers of the Cleveland Engineering Institute faculty, takes students step-by-step through each phase of laying-out and detailing a structure. Each student is assigned to a licensed architect who serves as personal instructor, grades the student's work and acts as his advisor throughout the course and after its completion. Literature giving details is available from Registrar, Cleveland Engineering Institute, 6300 Euclid Avenue, Cleveland 3, Ohio.

Insulating concrete. A series of specification sheets on systems of lightweight roof construction with Zonolite insulating concrete contains, in addition to specifications, properties, physical data, diagrammatic drawings on seven Zonolite systems. Included are pre-cast insulating roof tile, galvanized metal decks, paper-backed lath, structural concrete, and various formboards systems over which Zonolite concrete is applied. Zonolite Company, 135 South LaSalle Street, Chicago 3, Ill.

Roof decks. A brochure explains how Pyrofill Roof Decks adapt to flat, curved or pitched roofs of almost any design. Included is an explanation of how Pyrofill Gypsum concrete may be poured over a variety of permanent form-boards to meet almost any requirement for appearance, thermal insulation, sound control and other vital functions required of a modern ceiling. United States Gypsum Company, Industrial Roof Deck Department, 300 West Adams Street, Chicago 6, Ill.

Trowelers. If you are buying a trowel you will find "Buyer's Guide to Selection of Concrete Trowelers" a help in making a selection. Choice is no longer limited to big and little trowelers. Today there is a wide selection to suit your requirements. White Manufacturing Company, Elkhart 6, Ind.

Materials handler. A bulletin shows the "Moto-Bug" multi-purpose material handling tool equipped as a 1500-pound capacity fork lift, 18-cubic foot, 3000-pound capacity gravity dump hopper or tailgate dump truck, and a 45- by 54-inch platform deck. Equipped with a 5-foot utility blade, the R-18 Moto-Bug can be used for light-duty yard cleanup work or snow removal. An automatic coupler allows the machine to haul a 15- to 20-ton trailer load on dry, level concrete. Kwik-Mix Company, Port Washington, Wisc.

Truck regulations. The 1958 edition of "Truck and Trailer Size and Weight Restrictions," a pocket-size booklet compiling the laws of all 48 states and the District of Columbia regulating size and weight of trucks and trailers, has been prepared by the research department of the Four Wheel Drive Auto Company as a service to the trucking industry. Four Wheel Drive Auto Company, Clintonville, Wisc.

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Truck cranes and excavators. A new, 36-page illustrated catalogue offers complete specifications and capacities for the Schield Bantam equipment line including the crane-carrier mounted Model T-35, the Model C-35 crawler and the self-propelled Model CR-35. Also given are specifications for the manufacturer's line of crane carriers and ten specially designed Bantam attachments. Job application information, engineering features, on-the-job reports and job action photographs are included. Form 156R, Shield Bantam Company, Waverly, Iowa.

Lightweight aggregate concrete. Photographs and job stories in Master Builders Reporter No. 14 illustrate the wide variety of uses for lightweight aggregate concrete in modern construction. Thirteen construction projects are featured with discussion covering the use of lightweight concrete as a durable structural material for columns, beams and floor slabs, and in multi-storey structures, thin shell concrete and bridge decks. The job stories cite the role played by Pozzolith in providing adequate workability for proper placement while economically maintaining sufficient strength to meet structural requirements. The Master Builders Company, 7016 Euclid Avenue, Cleveland 3, Ohio.

Work Gloves. Industrial work gloves for all types of jobs are presented in a 16-page catalogue. These gloves are made to fit the natural hand shape and lined to reinforce the heavy duty coating. Special safety grip coating provides a more positive wet grip. Edmont Manufacturing Company, Coshocton, Ohio.

Film on prestressing. A film entitled "Prestressed Concrete Methods" shows the basic methods involved in the prestressing of bridge beams, piling, double T's and the production of some of the largest prestressed girders ever cast. It is available to anyone in the construction industry at no charge. Food Machinery and Chemical Corporation, Florida Division, Lakeland, Fla.

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